

P.O. Box 6820, Traverse City, MI 49696
1755 Barlow Street, Traverse City, MI 49686
Phone (231) 933-4041
Fax (231) 933-4393

August 4, 2005

Mr. Joseph Quandt
Zimmerman, Kuhn, Darling, Boyd, Taylor & Quandt, P.L.C.
412 South Union Street
P.O. Box 987
Traverse City, Michigan, 49685-0987

Re: Preliminary Design and Operation Proposal
Rapid Infiltration Basin System
Cherry Blossom, LLC
ISE Project #02061-57E

Dear Mr. Quandt:

I have undertaken review of Part 22 Rules related to Rapid Infiltration and developed a preliminary design and operations concept for a portion of the plant effluent. The portion of the plant effluent subject to this analysis is the aggregate plant flow less the fraction related to spent brine losses and first flushes of the soak process. Flow data has been provided by Brian Smith of Cherry Blossom, LLC (CB). Chemical composition of various process effluents and spent brine is estimated from limited laboratory data acquired over the past several years. From these data, ISE has estimated dilution volumes of well water (assuming no BOD and 20 mg/L Chloride) required such that mixing with the effluent will reduce the concentrations of permit-required monitoring parameters to levels below Rule 2222 criteria.

These provided flows, concentration and dilution volume estimates are provided on the attached Table 1. The proposed operation of this dilution procedure requires plant management to physically separate brine-rich flow and direct this flow to interim storage pending final disposition to a POTW, UIC Well disposal, or subsequent treatment and dilution. The lean plant effluent is proposed to be pumped to batching tanks provided by CB, where sufficient well water is added to attain the target effluent concentrations and to maintain necessary freeboard within tanks. Conductivity of the contained fluid will be monitored periodically to determine appropriate sampling time.

Initial dilution volume estimates indicate that chloride concentrations in the lean plant effluent will drive dilution water volume. Segregation of spent brine and its solutions from plant effluent should yield a nominal BOD₅ concentration in aggregated lean plant effluent at approximately 700 milligrams per liter (mg/L), ignoring the potential for aerobic degradation within piping and pump chambers prior to containing. Dilution of this wastewater to reduce chloride concentrations is expected to further reduce BOD to approximately 400 mg/L, based upon current estimates of waste character and flow data provided by CB. Additional dilution or aeration may be warranted prior to discharge. Aeration within the RIB system will occur as influent cascades over rip-rap and is exposed to the atmosphere.

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Samples of the diluted, lean plant effluent will be acquired and analyzed for permit-required constituents as well as BOD₅ and COD. Upon demonstration of attaining permit conditions, the dilute plant effluent will be pumped to an approved land application area within the permit-required application area as described below. If laboratory results indicate that further dilution is required, the dilution volume will be calculated from the batch laboratory results and 120% of the calculated dilution volume will be added prior to pumping to land application areas. Alternatively, additional analyses may be conducted and only 100% of the calculated dilution volume will be added.

It is proposed to implement land application of the diluted lean plant effluent via rapid infiltration methods in basins. It is estimated that over 120 acres would be required for land application if irrigation methods were utilized. It is estimated that rapid infiltration basin (RIB) techniques will require approximately one (1) acre and will not require the extensive water distribution system that is attendant with spray irrigation.

The preliminary design for the conceptual, interim RIB land application process is provided below:

Preliminary Engineering Calculation

Interim RI Basin Proposal

Darcy's Equation

$$Q = (K \times i \times A) / (n - 1)$$

K	1050 gpd / ft ²	Calculated by Nordlund Associates from Pump Test
K	980 gpd / ft ²	Calculated from Nordlund Associates Pump Test by ISE
K	800 gpd / ft ²	ISE Estimates from grain size analyses HS Report
K design	56 gpd / ft ²	7% of 800 gpd / ft ²
K design	7.5 ft / day	convert gals to ft ³
i	unity	From Methods of Soil Analysis (Part 1)
n	0.33	typical porosity (numerous sources)

Q / A	(7.5 x 1) / 0.33	22.5 ft ³ / ft ² * day
Unit Flow Rate		168 GPD / ft ²

Segregated Plant Flow with Dilution Water (see notes on Dilution Calculations for Plant Flows)	76000 gallons per day 10160 cuft/d
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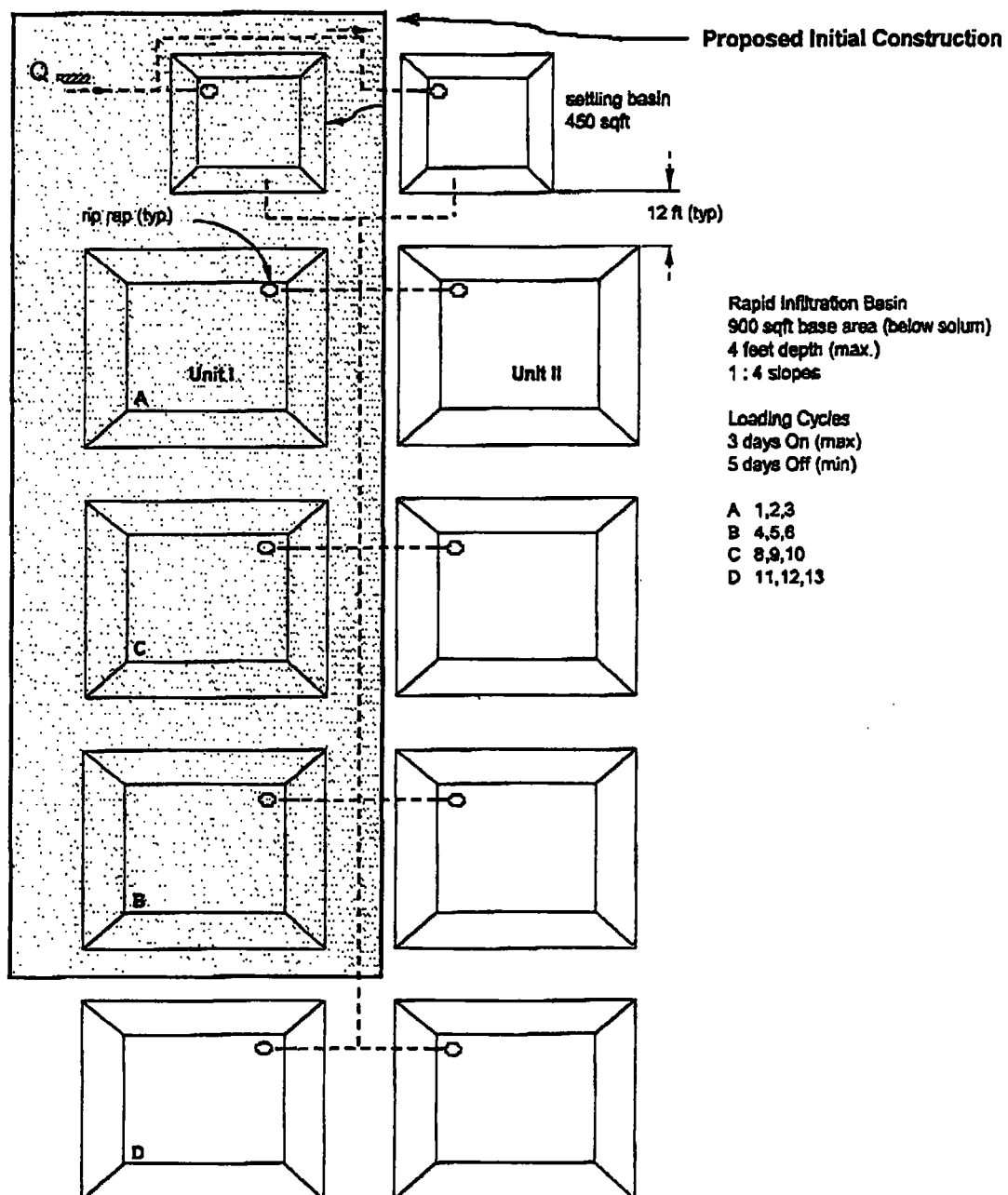
Minimum Application Area	$\frac{76000 \text{ GPD}}{168 \text{ GPD / ft}^2}$	450 ft ²
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Design Application Area (allow for additional diluted flows)	900 ft ²
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The design methodology is based upon EPA's Process Design Manual for Land Treatment of Municipal Wastewater, the EPA's Supplement on Rapid Infiltration/Overland Flow and applicable Part 22 Rules. As is observed in the dilution estimates and the use of safety factors in the above preliminary design, design criteria are very conservative given the proposed interim nature of this land application proposal.

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The RIB concept is proposed as a multi-cellular system proposed to be located as shown on Figure 1, which is excerpted from the Hydrogeologic Study (HS) Report. The multi-cell RIB system is proposed for installation in an area well characterized by investigation. The RIB system is shown below.



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The preliminary design above considers operation by altering loading and resting cycles on three (3) basins initially. A forth basin is shown (as is a redundant RIB system) to be constructed if operational experience suggest it necessary. Final sizing of berms and inclusion of spill-over structures is required to address safe storage volumes (targeted as one day of loading with 18 inches of free board) including the 3.2-inch 10-year, 24 hour storm event.


Modeling of water table mounding using empirical methods has not been evaluated as yet. Figure 2 is excerpted from the HS Report and depicts the hydrogeologic cross section interpreted from borings advanced as part of the HS. With the depth to water table at or about 50 feet below grade and an apparent erosional unconformity on the surface of the lower clay layer, mounding phenomenon that may potentially occur is likely best determined through groundwater monitoring. Ground water monitoring for evaluation of mounding and water quality is proposed below. Final design of the RIB system will include:

- pump, piping and control system design
- basin final sizing and grading plan
- permitting and site restoration/stabilization plans

Construction and operation will be undertaken in accordance with guidelines incorporated within the referenced EPA Process Design Manuals. An initial Irrigation Management Plan and Operations and Maintenance Plan will be drafted prior to operation, based upon RIB system final design and in accordance with MDEQ/EPA guidance. Operational monitoring should include a basin-flood infiltration pilot test to determine site-specific infiltration rates and any time-dependant changes resulting from discharge. Discharge monitoring will be accomplished through batch-specific analyses.

Ground water monitoring is proposed to evaluate trends in ground water elevations resulting from pumping and from infiltration and to document ground water quality prior to and during discharge. The enclosed potentiometric surface maps are excerpted from the HS Study and it supplement. The location of the proposed RIB system and pilot test is such that monitoring wells MW-601, MW-602 and the background monitoring wells BKG-S and BKG-D are suitable for the evaluation proposed above.

An additional monitoring well should be located to the east-northeast of the proposed RIB test area. This location will allow for evaluation of background water quality initially and perhaps mounding should it ever occur. Other monitoring wells installed as part of the HS will be monitored in accordance with MDEQ directives to be provided in the HS Report final approval letter which is pending. Water elevation measurements will be acquired to evaluate the long-term affect (if any) upon aquifer groundwater levels by daily production of dilution water. The production well (see PW-1 on the enclosed figures) located within the Maintenance Building in intended to supply the plant supply and dilution water required for lean plant effluent.

Where are they? 

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It is believed that the above preliminary design, operation and maintenance information provided herein should be sufficient to elicit appropriate comment from MDEQ prior to more detailed engineering development of the concept. Please call me if you or MDEQ staff have any questions or comments regarding any aspect of this submittal.

Respectfully,
INLAND SEAS ENGINEERING, INC.



Andrew Smits, P.E.
Geological Engineer

Table 1
Dilution Calculations for Plant Flows
Cherry Blossom, LLC
10190 Munro Road
Williamsburg, Michigan

Area/Process	Volume/Day [gal]	Volume/Day [L]	Average Cl- Conc [mg/L]	Average BOD [mg/L]	Average Na+ [mg/L]	Number of Lab Results	Sampling Dates	Volume for Cl- Dilution (gal) to 200 mg/L	Volume for BOD Dilution (gal) to 250 mg/L	Volume for BOD Dilution (gal) to 500 mg/L	Volume for Na+ Dilution (gal) to 120 mg/L
PITTING											
Transfer Losses	1,800	6,840									
Wash/Spray	2,650	10,070									
Effluent	4,450	16,910	228	1,090	93.5	4	July & Sept. 2002	895	15,010	5,271	-1184
SOAK/WASH											
Cherry Transfer	3,000	11,400	6,000	51,400	1,490	1	June 5, 2002	97,040	616,167	306,578	41250
Soak/Wash Tank Effluent	7,200	27,360	690	ND	296.8	13	Jan. & Feb. 2002	19,684			12923
Wash/Spray	1,100	4,180	20	0	20	BG		-1,104	-1,104	-1,104	-1104
Effluent Subtotal	11,300	42,940						115,619	615,063	305,474	63,078
COLOR											
Effluent	700	2,660	20	0	20	BG	NS	90	31,340	15,319	13176
CONCENTRATOR											
Effluent	3,000	11,400	20	0	20	BG	NS	-3,012	-3,012	-3,012	-3012
FINISHING/PACKAGING											
Wash/Spray	1,600	6,080	20	0	20	BG	NS	-1,606	-1,606	-1,606	-1606
TOTAL DAILY VALUES:	21,050	79,980	1,342	9,254				111,786	656,795	321,446	60,452
Lean Plant Effluent	18,050	68,590	346	711				14,746	40,828	14,868	18,193
Effluent at Chloride Dilution	32,796	124,626	190	393							

NOTES:

ND = No Data

BG = Assumed background values from well

Shading indicates analytical data reported by other consultants

Plant discharges based on client provided flow measurements

Exemptions 6, 9 applies to pages 7-8

KEY TO BORING LOGS

Based on ASTM Test Method D 2488-90

SOILS ARE DESCRIBED IN THE FOLLOWING ORDER:

- 1) Proportional descriptions of particle sizes beginning with largest percent by volume
- 2) Dominant color of soil
- 3) Density or consistency if evaluated
- 4) Moisture condition of soil
- 5) Noteworthy observations (Visual/Olfactory)

Example: SAND, medium, some fine gravel, trace clay, brown, medium dense, moist, petroleum odor.

PARTICLE SIZE DISTRIBUTION

Gravel: Particles of rock smaller than 3.0 inch and larger than 0.20 inch in diameter, with the following subdivisions:

Coarse: 3.0 inch to 0.75 inch
Fine: 0.75 inch to 0.20 inch

Sand: Particles of rock smaller than 0.20 inch and larger than 0.003 inch in diameter, with the following subdivisions:

Coarse: 0.20 inch to 0.08 inch
Medium: 0.08 inch to 0.02 inch
Fine: 0.02 inch to 0.003 inch

Silt: Soil smaller than 0.003 inch in diameter that is nonplastic or very slightly plastic, and that exhibits little or no strength when air dry.

Organic Silt: A silt with sufficient organic content to influence the soil properties.

Clay: Soil smaller than 0.003 inch in diameter that can be made to exhibit plasticity (putty like properties), and that exhibits considerable strength when air dry.

Organic Clay: A clay with sufficient organic content to influence the soil properties.

Peat: A soil composed primarily of vegetable tissue in various stages of decomposition usually with an organic odor, a dark brown to black color, a spongy consistency, and a texture ranging from fibrous to amorphous.

DENSITY & CONSISTENCY

Coarse grained soils (major portion retained on No. 200 sieve) include:

- 1) Clean gravels
- 2) Silty or clayey gravels
- 3) Silty, clayey or gravelly sands

Consistency is rated according to standard penetration resistance.

Descriptive Term	Standard Penetration Resistance (N) Blows/Ft.
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-60
Very Dense	Over 60

Fine grained soils (major portion passing No. 200 sieve) include:

- 1) Inorganic and organic silts and clays
- 2) Gravelly, sandy or silty clays
- 3) Clayey silts

Consistency is rated according to shearing strength as indicated by penetrometer readings, vane test, or by triaxial test.

Descriptive Term	Shear Strength (ksf)
Very Soft	less than 0.25
Soft	0.25-0.50
Firm	0.5-1.0
Stiff	1.0-2.0
Very Stiff	2.0-4.0
Hard	4.0 and higher

MOISTURE CONDITION OF SOIL

Dry: Absence of moisture, dusty, dry to the touch
Moist: Damp but no visible water
Wet: Visible free water, usually soil is below water table

PROPORTIONAL DESCRIPTIONS (by volume)

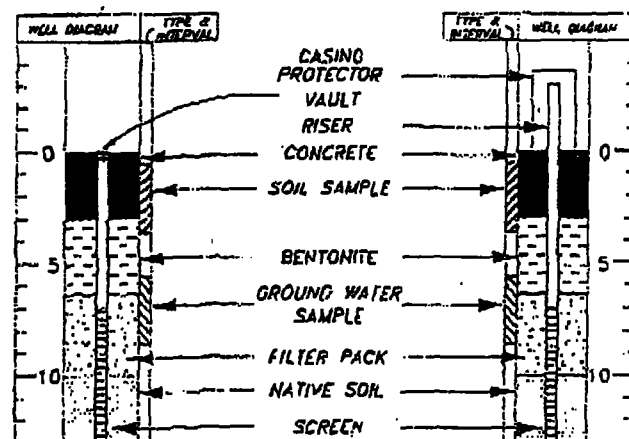
~y 35-60% (Gravelly, Sandy, Silty, Clayey)
Some: 20-35%
Little: 10-20%
Trace: 1-10%

COMMON ABBREVIATIONS

SBS = Split Barrel Sampler
HSA = Hollow Stem Augers
PID = Photolization Detector
KS = 1" x 2" Kansas Sampler
MS = 2" x 4" Macro Sampler
PP = Pocket Penetrometer
ST = Shelby Tube
SA = Screened Auger
SP = Slotted Probe
TMW = Temporary Monitor Well

COMMON SYMBOLS


Observed Soil Horizon: —
Inferred Soil Horizon: - - -
End of Soil Boring: —
Observed Water Table:



Aug. 4. 2005 3:26PM

ZIMMERMAN KUHN DARLING BOYD


No. 0068 P. 13/32

 INLAND SEAS ENGINEERING Traverse City 231-933-4041 Flushing 810-487-0565		BORING: SB-1A		PREPARED FOR: Zimmerman, Kuhn, Darling, Boyd, Taylor and Quandt 412 South Union Street Traverse City, Michigan 49684			
		Williamsburg Receiving and Storage Williamsburg, Michigan					
DEPTH	SOIL DESCRIPTION AND COMMENTS	PERCENT RECOVERY	SAMPLE METHOD	TYPE & INTERVAL		PID READING (ppm)	DEPTH
	GRADE Grass						
	SAND, fine, some organic material, black, wet	62%	MS				
5	SAND, fine, some silt, trace gravel, brown, moist						5
	SAND, fine, some silt, brown, wet	100%					
10	SAND, fine, trace silt, brown, moist to wet						10
		92%	DT				
15	SAND, fine, light brown, moist						15
		100%					
20	SAND, fine, brown, moist	100%					20
	E.O.B. 20 Feet						
25							25
30							30
35	DT = 1 1/2" diameter, 4' dual tube sampler						35
Drilling Contractor:		Driller:		Drilling Method:		Date Drilled:	
Manitou Tech Services		Scott Zenner		Geo Probe AMS 9600		7/8/2002	
Logged By:		Logging Method:		Project #:		Sheet Number:	
T. Adil Chowdhury		ASTM 2488		239908410		1 of 1	

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ZIMMERMAN KUHN DARLING BOYD


No. 0068 P. 14/32

 INLAND SEAS ENGINEERING Traverse City 231-933-4041 Flushing 810-487-0555		BORING: SB-2A		PREPARED FOR: Zimmerman, Kuhn, Darling, Boyd, Taylor and Quandt 412 South Union Street Traverse City, Michigan 49684			
		Williamsburg Receiving and Storage Williamsburg, Michigan					
DEPTH	SOIL DESCRIPTION AND COMMENTS	PERCENT RECOVERY	SAMPLE METHOD	TYPE & INTERVAL		PID READING (ppm)	DEPTH
	GRADE Grass						
	SAND, medium fine, some cobbles, trace silt, light brown, moist	75%	MS				
5	SAND, fine, trace silt, light brown, moist						5
	SAND, fine, some cobbles, little coarse, brown, moist	100%					
	SAND, medium fine, trace silt, light brown, moist	100%					
10		100%					10
		88%	DT				
15	SAND, coarse, some cobbles, light brown, moist	92%					15
		98%					
20	SAND, fine, some cobbles, light brown, moist						20
	E.O.B. 20 Feet						
25							25
30							30
35	DT = 1 1/2" diameter, 4' dual tube sampler						35
Drilling Contractor:		Driller:		Drilling Method:		Date Drilled:	
Manitou Tech Services		Scott Zenner		Geo Probe AMS 9600		7/8/2002	
Logged By:		Logging Method:		Project #:		Sheet Number:	
T. Adil Chowdhury		ASTM 2488		239908410		1 of 1	

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ZIMMERMAN KUHN DARLING BOYD

No. 0068 P. 15/32

 INLAND SEAS ENGINEERING Traverse City 231-939-4041 Flushing 810-487-0555		BORING: SB-3A		PREPARED FOR: Zimmerman, Kuhn, Darling, Boyd, Taylor and Quandt 412 South Union Street Traverse City, Michigan 49684			
		Williamsburg Receiving and Storage Williamsburg, Michigan					
DEPTH	SOIL DESCRIPTION AND COMMENTS	PERCENT RECOVERY	SAMPLE METHOD	TYPE & INTERVAL		PID READING (ppm)	DEPTH
	GRADE Grass						
	SAND, fine, trace gravel, brown, moist		MS				
	SAND, fine, some coarse, trace silt, brown, moist	67%					
5	SAND, coarse, trace gravel, brown, moist						5
	SAND, fine, some coarse, dark brown, moist	72%					
		100%					
10			DT				10
		63%					
15		98%					15
		98%					
20	SAND, fine, some silt, little coarse, brown, moist						20
	E.O.B. 20 Feet						
25							25
30							30
35	DT = 1 1/2" diameter, 4' dual tube sampler						35
Drilling Contractor:		Driller:		Drilling Method:		Date Drilled:	
Mankou Tech Services		Scott Zenner		Geo Probe AMS 9600		7/8/2002	
Logged By:		Logging Method:		Project #:		Sheet Number:	
T. Adil Chowdhury		ASTM 2488		239908410		1 of 1	



Traverse City 231-933-4041
Flushing 810-487-0555

BORING: SB-4A

Williamsburg Receiving and Storage
Williamsburg, Michigan

PREPARED FOR:

Zimmerman, Kuhn, Darling,
Boyd, Taylor and Quandt
412 South Union Street
Traverse City, Michigan 49684

DEPTH	SOIL DESCRIPTION AND COMMENTS	PERCENT RECOVERY	SAMPLE METHOD	TYPE & INTERVAL	PID READING (ppm)	DEPTH
	GRADE Grass					
	SAND, fine, trace gravel, some organics, some silt, brown, dry to moist		MS			
5	SAND, fine, trace silt, light brown, moist	65%				5
		67%				
	SAND, fine, some silt, brown moist					
10	SAND, fine, some silt, dark brown, moist	81%				10
	SAND, fine, some, silt, light brown, moist					
		92%				
	SAND, fine, trace cobbles, some silt, dark brown, moist					
15	SAND, fine, trace silt, dark brown, dry to moist	100%				15
		100%				
	SAND, fine, trace silt, light brown, moist	100%				
20	SAND, fine, trace silt, dark brown, moist	100%				20
	E.O.B. 20 Feet					
25						25
30						30
35	DT = 1 1/2" diameter, 4' dual tube sampler					35
Drilling Contractor:		Driller:		Drilling Method:		Date Drilled:
Manitou Tech Services		Scott Zenner		Geo Probe AMS 9600		7/8/2002
Logged By:		Logging Method:		Project #:		Sheet Number:
T. Adil Chowdhury		ASTM 2488		239908410		1 of 1

Aug. 4. 2005 3:26PM

ZIMMERMAN KUHN DARLING BOYD

No. 0068 P. 17/32



Traverse City 231-933-4041
Flushing 810-487-0556

BORING: SB-5A

Williamsburg Receiving and Storage
Williamsburg, Michigan

PREPARED FOR:

Zimmerman, Kuhn, Darling,
Boyd, Taylor and Quandt
412 South Union Street
Traverse City, Michigan 49685-0987

DEPTH	SOIL DESCRIPTION AND COMMENTS	PERCENT RECOVERY	SAMPLE METHOD	TYPE & INTERVAL	PID READING (ppm)	DEPTH
	GRADE Grass					
5	SAND, fine, trace silt, brown, moist	71%	MS			5
		78%				
10	SAND, fine, some coarse, trace gravel, brown, moist	78%				10
	SAND, fine, some organics, trace gravel, dark brown, moist	100%	DT			
15		100%				15
		100%				
20	SAND, fine, some silt, light brown, moist					20
	E.O.B. 20 feet					
25						25
30						30
35	DT = 1 1/2" diameter, 4' dual tube sampler					35
Drilling Contractor:		Driller:		Drilling Method:		Date Drilled:
Manitou Tech Services		Scott Zenner		Geo Probe AMS 9600		7/8/2002
Logged By:		Logging Method:		Project #:		Sheet Number:
T. Adil Chowdhury		ASTM 2488		239908410		1 of 1

ATTACHMENT 2

FIGURES

and

TABLES

08/16/2002

TABLE 1
Soil Moisture Content and Apparent Soil Conductivity
Soil Total Chloride and Leachate Potential Analytical Results

Williamsburg Receiving & Storage

ISE Project # 02399084-10E

Boring and Depth, feet	Conductivity, mS / cm	Moisture Content, weight %	Dry Weight Conductivity, mS / cm-g	Total Chloride, mg / Kg	Synthetic Precipitate Leaching Procedure (SPLP)		
					Chloride, mg / L	Sodium, mg / L	Phosphorus, mg / L
SB1A 0-1	0.39	33.4%	1.48E-02	197	6	9.68	0.11
SB1A 1-2	0.10	18.4%	2.46E-03				
SB1A 2-3	0.10	8.3%	2.07E-03				
SB1A 3-4	0.18	7.1%	3.23E-03				
SB1A 4-5	0.30	17.1%	5.98E-03	104	3	11.20	<0.05
SB1A 5-6	0.20	20.3%	4.40E-03				
SB1A 6-7	0.26	12.4%	5.36E-03	117			
SB1A 7-8	0.16	14.5%	3.49E-03				
SB1A 8-9	0.15	14.6%	3.39E-03				
SB1A 9-10	0.16	14.6%	3.59E-03				
SB1A 10-11	0.11	18.8%	2.71E-03				
SB1A 11-12	0.15	19.4%	3.38E-03		1	8.80	<0.05
SB1A 12-14	0.05	3.0%	9.86E-04	31	1	4.27	<0.05
SB1A 14-16	0.04	2.9%	8.04E-04				
SB1A 16-18	0.05	4.0%	9.77E-04	119	1	4.96	<0.05
SB1A 18-20	0.04	2.9%	8.09E-04				
SB2A 0-1	0.08	4.0%	1.64E-03				
SB2A 1-2	0.03	2.7%	6.02E-04				
SB2A 2-3	0.07	5.4%	1.52E-03				
SB2A 3-4	0.05	2.0%	9.94E-04				
SB2A 4-5	0.07	2.4%	1.45E-03				
SB2A 5-6	0.04	2.2%	8.02E-04	22	1	5.29	<0.05
SB2A 6-7	0.11	2.9%	2.27E-03	39	1	5.63	<0.05
SB2A 7-8	0.05	3.0%	1.08E-03				
SB2A 8-9	0.10	4.6%	2.02E-03				
SB2A 9-10	0.07	4.5%	1.44E-03				
SB2A 10-11	0.07	1.9%	1.50E-03				
SB2A 11-12	0.04	2.6%	8.03E-04	30	1	4.45	<0.05
SB2A 12-14	0.05	2.3%	1.02E-03				
SB2A 14-16	0.06	3.3%	1.22E-03				
SB2A 16-18	0.07	3.1%	1.46E-03	30	1	4.13	<0.05
SB2A 18-20	0.04	3.1%	8.63E-04	15	< 1	3.63	<0.05

08/16/2002

Boring and Depth, feet	Conductivity, mS / cm	Moisture Content, weight %	Dry Weight Conductivity, mS / cm-g	Total Chloride, mg / Kg	Synthetic Precipitate Leaching Procedure (SPLP)		
					Chloride, mg / L	Sodium, mg / L	Phosphorus, mg / L
SB3A 0-1	0.02	1.0%	3.96E-04				
SB3A 1-2	0.01	2.7%	2.01E-04				
SB3A 2-3	0.01	3.2%	1.99E-04				
SB3A 3-4	0.02	2.4%	4.40E-04				
SB3A 4-5	0.03	4.0%	6.31E-04				
SB3A 5-6	0.09	6.0%	1.90E-03				
SB3A 6-7	0.09	6.0%	1.95E-03		2	8.93	0.53
SB3A 7-8	0.05	2.5%	1.07E-03	63			
SB3A 8-9	0.08	8.4%	1.81E-03				
SB3A 9-10	0.11	7.2%	2.27E-03				
SB3A 10-11	0.16	8.8%	3.37E-03	98	2	6.05	<0.05
SB3A 11-12	0.04	8.3%	8.32E-04	30	1	5.33	0.06
SB3A 12-14	0.05	3.0%	1.01E-03				
SB3A 14-16	0.05	2.8%	1.06E-03				
SB3A 16-18	0.13	3.7%	2.66E-03	115	1	4.91	< 0.05
SB3A 18-20	0.07	2.6%	1.39E-03	77	1	3.48	<0.05
SB4A 0-1	0.29	2.4%	5.68E-03	23	1	5.94	0.11
SB4A 1-2	0.05	3.7%	1.01E-03				
SB4A 2-3	0.04	3.8%	8.25E-04				
SB4A 3-4	0.08	4.6%	1.86E-03				
SB4A 4-5	0.05	2.3%	9.42E-04				
SB4A 5-6	0.05	2.8%	1.00E-03				
SB4A 6-7	0.05	4.4%	1.02E-03				
SB4A 7-8	0.08	3.6%	1.63E-03				
SB4A 8-9	0.06	2.9%	1.18E-03				
SB4A 9-10	0.05	5.0%	1.25E-03				
SB4A 10-11	0.10	6.4%	2.03E-03				
SB4A 11-12	0.06	7.1%	1.26E-03	41	1	6.33	0.51
SB4A 12-13	0.11	3.9%	2.29E-03				
SB4A 13-14	0.05	5.0%	1.03E-03				
SB4A 14-15	0.19	2.5%	3.73E-03	32	1	5.15	<0.05
SB4A 15-16	0.12	3.4%	2.50E-03				
SB4A 16-17	0.06	4.9%	1.19E-03				
SB4A 17-18	0.03	4.3%	5.89E-04				
SB4A 18-19	0.019	4.3%	3.76E-04	25	< 1	4.95	0.40
SB4A 19-20	0.04	4.4%	8.39E-04	86	< 1	5.13	0.05

08/16/2002

Boring and Depth, feet	Conductivity, mS / cm	Moisture Content, weight %	Dry Weight Conductivity, mS / cm-g	Total Chloride, mg / Kg	Synthetic Precipitate Leaching Procedure (SPLP)		
					Chloride, mg / L	Sodium, mg / L	Phosphorus, mg / L
SB5A 0-1	0.09	5.1%	1.63E-03				
SB5A 1-2	0.01	4.2%	2.08E-04				
SB5A 2-3	0.020	3.0%	3.84E-04				
SB5A 3-4	0.03	3.4%	5.92E-04				
SB5A 4-5	0.01	2.8%	2.27E-04	22	1	6.20	0.06
SB5A 5-6	0.07	4.4%	1.43E-03				
SB5A 6-7	0.06	3.1%	1.80E-03	72	1	5.79	<0.05
SB5A 7-8	0.06	7.5%	1.24E-03				
SB5A 8-9	0.06	4.6%	1.23E-03				
SB5A 9-10	0.05	4.1%	1.04E-03				
SB5A 10-11	0.01	3.3%	2.03E-04	76	1	6.01	<0.05
SB5A 11-12	0.10	2.8%	1.98E-03	25	1	5.62	0.11
SB5A 12-14	0.06	4.6%	1.38E-03				
SB5A 14-16	0.04	6.9%	9.71E-04				
SB5A 16-18	0.01	6.6%	2.18E-04	71	1	6.12	0.59
SB5A 18-20	0.07	7.0%	1.47E-03	65	1	5.04	0.59
Part 201 Residential/Commercial I Generic Cleanup Criteria (June 2000)				Chloride 5,000 mg / kg	Chloride 250 mg / L	Sodium 120 mg / L	Phosphorus 63 mg / L

19:\sesrvr\Clients\Menmuir,Z,K,T&Quandt\02309084-Williamsburg Recycling and Storage\LabData&Engineering.xls



Traverse City 231-933-4041
Flushing 810-487-0555

WELL:

MW-601 Page 1 of 3

Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 48890

PREPARED FOR:

Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 48890

DEPTH	SOIL DESCRIPTION AND COMMENTS	PERCENT RECOVERY	SAMPLE METHOD	TYPE & INTERVAL	BLOW COUNT	WELL DIAGRAM	DEPTH
0	GRADE Grass						0
5							5
10							10
15							15
20		95	SBS		8-15-30-41		20
25	Sand, fine, light brown, moist						
	Sand, silty, dark brown, moist	90	SBS		8-16-25-51		25
30		95	SBS		18-24-43-50		30
35	Sand, fine, light brown, moist						35

Drilling Contractor:

E & G Drilling

Driller:

Bob Garbers

Drilling Method:

4 1/2" HSA

Date Drilled:

10/17/03

Logged By:

JDH

Logging Method:

ASTM D 2488

Development Method:

Ballor

Project #:

02633061

Casing Type:

PVC

Screen Type and Length:

PVC 5 ft

Ground Elevation:

675.01

Top of Casing Elevation:

678.24


Sheet Number:

1 of 3

Aug. 4. 2005 3:27PM

ZIMMERMAN KUHN DARLING BOYD

No. 0068 P. 23/32

 Phone City 231-833-4041 Fax 810-487-0555		WELL: MW-601 Page 2 of 3		PREPARED FOR:			
		Williamsburg Receiving and Storage LLC 10190 Munro Road Williamsburg, MI 49690		Williamsburg Receiving and Storage LLC 10190 Munro Road Williamsburg, MI 49690			
DEPTH	SOIL DESCRIPTION AND COMMENTS	PERCENT RECOVERY	SAMPLE METHOD	TYPE & INTERVAL	BLOW COUNT	WELL DIAGRAM	DEPTH
40	Sand, fine, light brown, moist	40	SBS		17-50		40
45	Sand, fine, few gravel, light brown, moist						45
50	Sand, fine, trace gravel, light brown, moist	60	SBS		5-21-37-50		50
55	Sand, fine, trace silt, brown, wet						55
60	Sand, fine to medium, trace coarse sand, light brown, wet	100	SBS		19-12-21-50		60
65	Sand, fine to medium, trace silt, wet						65
70							70
75							75
Drilling Contractor: E & G Drilling		Driller: Bob Gerbers		Drilling Method: 4 1/2" HSA		Date Drilled: 10/17/03	
Logged By: JDH		Logging Method: ASTM D 2488		Development Method: Baller		Project #: 02633061	
Casing Type: PVC		Screen Type and Length: PVC 5 ft		Ground Elevation: 675.01		Top of Casing Elevation: 678.24	
						Sheet Number: 2 of 3	

Aug. 4. 2005 3:28PM

ZIMMERMAN KUHN DARLING BOYD

No. 0068 P. 24/32



Traverse City 231-933-4041
Flushing 810-487-0555

WELL:

MW-601 Page 3 of 3

Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 49690

PREPARED FOR:

Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 49690

DEPTH	SOIL DESCRIPTION AND COMMENTS	PERCENT RECOVERY	SAMPLE METHOD	TYPE & INTERVAL	BLOW COUNT	WELL DIAGRAM	DEPTH
	Fine sand, trace medium, light brown, wet, coarsening upward	100	SBS		18-32-43-50		
80		80	SBS		3-4-7-22		80
85							85
90	Sand, fine, trace medium, light brown, saturated	80	SBS		24-38-54-50		90
95							95
100	Sand, fine, trace silt, light brown, saturated	60	SBS		24-30-25-50		100
	EOB @ 101'						
105							105
110							110
115							115
Drilling Contractor: E & G Drilling		Driller: Bob Gerbers		Drilling Method: 4 1/2" HSA		Date Drilled: 10/17/03	
Logged By: JDH		Logging Method: ASTM D 2485		Development Method: Bailer		Project #: 02533061	
Casing Type: PVC		Screen Type and Length: PVC 5 ft		Ground Elevation: 675.01		Sheet Number: 3 of 3	
				Top of Casing Elevation: 678.24			

Aug. 4, 2005 3:28PM

ZIMMERMAN KUHN DARLING BOYD

No. 0068 P. 25/32



Traverse City 231-933-4041
Flushing 810-487-0558

WELL:

MW-602 Page 1 of 3

Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 49690

PREPARED FOR:

Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 49690

DEPTH	SOIL DESCRIPTION AND COMMENTS	PERCENT RECOVERY	SAMPLE METHOD	TYPE & INTERVAL	BLOW COUNT	WELL DIAGRAM	DEPTH
0	GRADE Grass						0
5							5
10							10
15							15
20	Sand, fine, light brown Silt, dark brown Sand, fine, light brown	95	SBS		17-15-41-50		20
25		60	SBS		15-26-50		25
30		60	SBS		15-30-50		30
35	Sand, fine, light brown, moist	55	SBS		14-48-50		35

Drilling Contractor:

E & G Drilling

Driller:

Bob Gerbers

Drilling Method:

4 1/2" HSA

Date Drilled:

10/17/03

Logged By:

JDH

Logging Method:

ASTM D 2488

Development Method:

Bailer

Project #:

02633061

Casing Type:

PVC

Screen Type and Length:

PVC 5 ft

Ground Elevation:

677.89

Top of Casing Elevation:

681.19

Sheet Number:

1 of 3



Traverse City 231-939-4041
Flushing 810-487-0555

WELL:

MW-502 Page 2 of 3

Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 49690

PREPARED FOR:

Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 49690

DEPTH	SOIL DESCRIPTION AND COMMENTS	PERCENT RECOVERY	SAMPLE METHOD	TYPE & INTERVAL	BLOW COUNT	WELL DIAGRAM	DEPTH
40		60	SBS		17-50		40
45							45
50	Sand, fine, light brown, moist Sand, fine, brown, moist Sand, fine, trace silt, light brown, moist	55	SBS		5-21-37-50		50
55 ▽							55 ▽
60	Sand, fine, trace medium, light brown, Sand, silty, wet	100	SBS		18-12-21-50		60
65							65
70		100	SBS				70
75	Sand, fine, trace medium, light brown, wet, heave						75
Logging Contractor: E & G Drilling		Driller: Bob Gerbers		Drilling Method: 4 1/2" HSA		Date Drilled: 10/17/03	
Logged By: JDH		Logging Method: ASTM D 2488		Development Method: Bailer		Project #: 02533061	
Casing Type: PVC		Screen Type and Length: PVC 5 ft		Ground Elevation: 677.89		Top of Casing Elevation: 681.19	
						Sheet Number: 2 of 3	

Aug. 4. 2005 3:28PM

ZIMMERMAN KUHN DARLING BOYD

No. 0068 P. 27/32



Traverse City 231-933-4041
Flushing 810-487-0555

WELL:

MW-602 Page 3 of 3

Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 49690

PREPARED FOR:

Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 49690

DEPTH	SOIL DESCRIPTION AND COMMENTS	PERCENT RECOVERY	SAMPLE METHOD	TYPE & INTERVAL	BLOW COUNT	WELL DIAGRAM	DEPTH
80		100	SBS		18-44-27-33		80
85							85
90	Sand, fine, trace medium, light brown, wet, heave Sand, fine to medium, light brown, wet	70	SBS		16-8-10-12		90
95							95
100	Sand, fine, light brown, wet, EOB@99'	95	SBS		28-49-37-50		100
105							105
110							110
115							115
Drilling Contractor: E & G Drilling		Driller: Bob Gerbers		Drilling Method: 4 1/4" HSA		Date Drilled: 10/17/03	
Logged By: JDH		Logging Method: ASTM D 2486		Development Method: Baŕer		Project #: 02633081	
Casing Type: PVC		Screen Type and Length: PVC 5 ft		Ground Elevation: 677.89		Top of Casing Elevation: 681.19	
				Sheet Number: 3 of 3			



Traverse City 231-833-4041
Flushing 810-487-0555

WELL:

Background Monitor Well

Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 49690

PREPARED FOR:

Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 49690

DEPTH	SOIL DESCRIPTION AND COMMENTS	PERCENT RECOVERY	SAMPLE METHOD	TYPE & INTERVAL	BLOW COUNT	WELL DIAGRAM	DEPTH
	GRADE Grass						
5	Sand, medium to coarse, trace gravel, brown, medium dense, moist	50	SBS		3,5,5,7		5
	Sand, medium to coarse, reddish brown, loose, moist	50	SBS		4,7,5,5		
	Sand, medium, trace clay, reddish brown, loose, moist						
10	Sand, medium to coarse, trace silt, trace clay, reddish brown, loose, moist	75	SBS		1,2,3,6		10
	Sand, fine to medium, brown, medium dense, moist	50	SBS		6,12,16,20		
	Sand, medium, brown, dense, moist	75	SBS		9,20,26,27		
15		75	SBS		10,18,21		15
	Sand, medium, tan, medium dense, moist	75	SBS		11,24,37,41		
		50	SBS		15,33,43		
20		50	SBS		17,35,46		20
25	Sand, medium, tan, very dense, moist	50	SBS		16,38,43		25
30		50	SBS		20,66		30
35	Sand, medium to coarse, tan, very dense, moist	30	SBS		25,50		35
Drilling Contractor: Shepler Drilling		Driller: Randy Shepler		Drilling Method: 4 1/2" H8A		Date Drilled: 5/20/03	
Logged By: JTH		Logging Method: ASTM 2488		Development Method: Bailer		Project #: 02633061-25	
Casing Type: 2" Schedule 40 PVC		Screen Type and Length: 2" PVC 5 ft		Ground Elevation: 682.4		Sheet Number: 1 OF 2	
				Top of Casing Elevation: S - 684.68 / D - 684.3			

Aug. 4. 2005 3:28PM

ZIMMERMAN KUHN DARLING BOYD

No. 0068 P. 29/32



Traverse City 231-933-4041
Flushing 810-487-0556

WELL:

Background Monitor Well

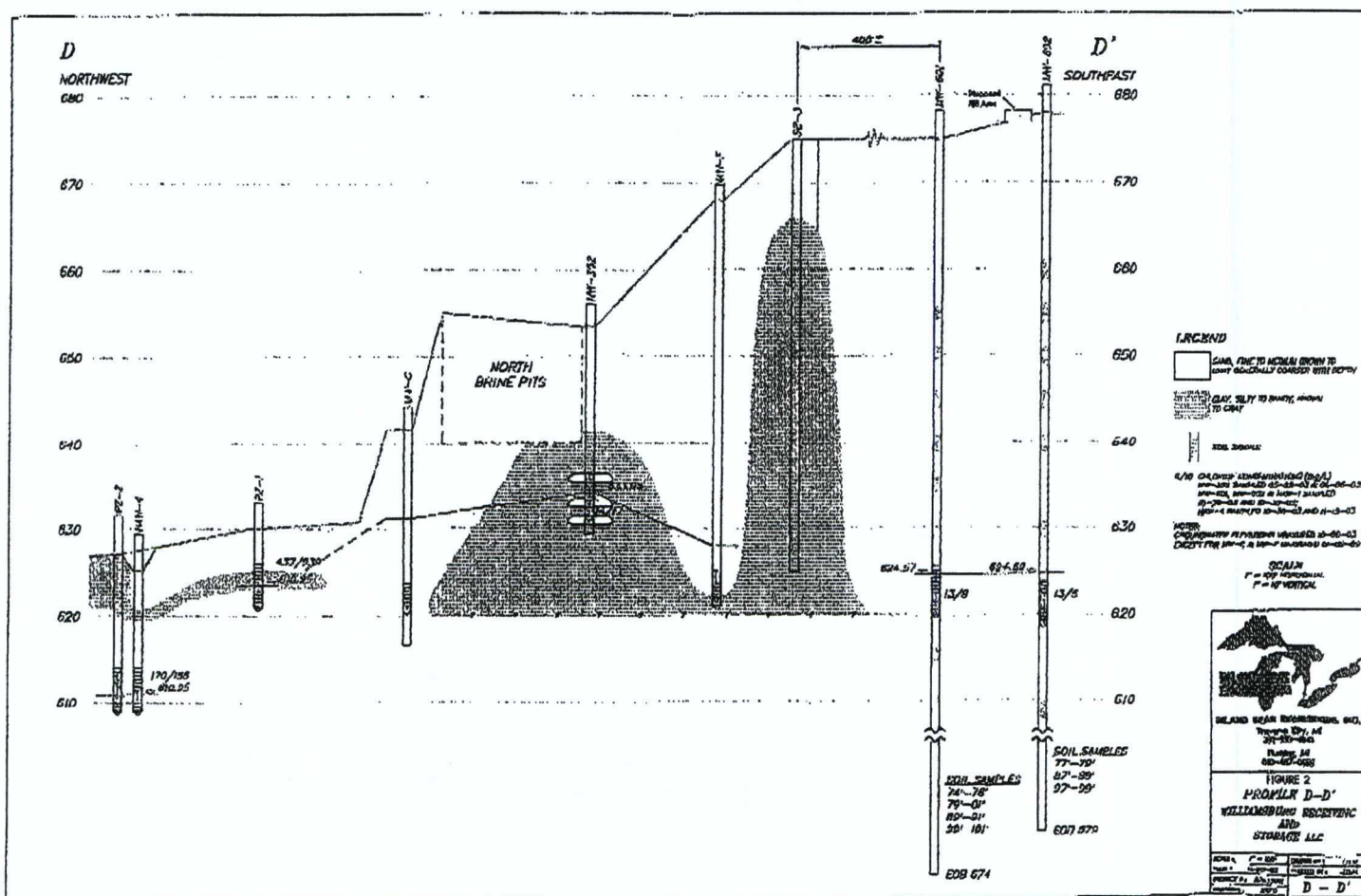
Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 49690

PREPARED FOR:

Williamsburg Receiving and Storage LLC
10190 Munro Road
Williamsburg, MI 49690

DEPTH	SOIL DESCRIPTION AND COMMENTS	PERCENT RECOVERY	SAMPLE METHOD	TYPE & INTERVAL	BLOW COUNT	WELL DIAGRAM	DEPTH
40	Sand, coarse, some gravel, very dense, moist	30	SBS		17.71		40
45	Sand, medium to coarse, very dense, moist	30	SBS		33.58		45
50							50
55	Sand, coarse, trace gravel, very dense, moist	20	SBS		60.30		55
60							60
65	Sand, coarse, some gravel, very dense, wet	20	SBS		17.41		65
70							70
75	Trace Gravel EOB = 75 ft	0	SBS				75
Drilling Contractor: Shepler Drilling		Driller: Randy Shepler		Drilling Method: 4 1/2" HSA		Date Drilled: 5/20/03	
Logged By: JTH		Logging Method: ASTM 2488		Development Method: Bailer		Project #: 02633061-25	
Casing Type: 2" PVC		Screen Type and Length: 2" PVC 5 ft		Ground Elevation: 682.4		Top of Casing Elevation: S - 684.68 / D - 684.3	
						Sheet Number: 2 OF 2	

Exemption 9



Exemption 9